

# **Health Systems Engineering in the Design Process**

David Cowan  
Academic Program Director  
Health Systems

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# Engineering Thinking

© As apposed to...

© Scientific thinking

- Still Quantitative but
- Hypothesis – study
- Classify – Organize to understand
- One Best solution

© Intuitive thinking

- Qualitative
- Artistic – Creative
- Envisioning

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# Engineering Thinking

© Quantitative

© Systems

© Optimization

© Modeling

© Continuous Improvement

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## Other Ways to Think

© These are still somewhat a mystery to me

© Doctors

© Nurses

© Managers

© Wives

© Politicians – whatever the voters will support until you get elected

© Teenagers- “Kool what are we doing this weekend”

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# Engineering Methods

## © Descriptive

- © Define

- © Scope

- © Key Measures

- © Pivot the Room

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# Engineering Methods

## © Process

- © Flow charts
- © Transitions
- © Swim Lanes
- © Spaghetti

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# Engineering Methods

## © Measures

- © Direct

- © Proxy

- © Complex (RVUs)

- © Charts

- © Statistics

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# Engineering Methods

## © Models

- © Simulation
- © Optimization
- © Descriptive
- © Flexible

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# Engineering Goals

- © Solutions
- © Improvement
- © Predictive
- © Quality
- © Productive - Efficient
- © Outcomes – Effective
- © Practical

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# Healthcare Issues

## ◎ IOM – 6 Aims

- ◎ Effective
- ◎ Efficient
- ◎ Equitable
- ◎ Timely
- ◎ Safe
- ◎ Patient Centered

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# Defining Healthcare Quality

© Donabedian

© Process

© Structure

© Outcomes

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# ER's

## ◎Key Issues

- ◎Access
- ◎Timeliness
- ◎Patient Flow
- ◎Centeredness
- ◎Scope of Capabilities
- ◎Flexibility
- ◎Surge

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# Access

© Location

© Mode of Arrival

© Triage (financial and medical)

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# Timeliness

⦿ Accident to Medical Attention

⦿ Door to

⦿ Triage

⦿ Doctor

⦿ Room

⦿ Disposition

⦿ Disposition to Discharge

⦿ Disposition to Room

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# Centered - ness

◎ Patient

◎ Family

◎ Provider

◎ Nurse

◎ Doctor

◎ Finance (who pays for all this?)

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# Flexibility

© So many unique needs

© Wide fluctuation of unscheduled demand

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# Some Key Concepts

◎ Trauma Level

◎ Diversion

◎ Protocols

◎ Surge

◎ PACS

◎ EMR

◎ CPOE

◎ Elopement/LWBS

◎ STAT

◎ Pyxis

◎ MidLevel

◎ Trauma

◎ Doctors

◎ ER

◎ Trauma Surgeon

◎ Consultants

◎ Telemedicine

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# **Time is a most precious commodity**

- © Patient
- © Doctor
- © Facility
- © Successful outcomes
- © Cost of Care is tied to time
- © Communication

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## Types of ERs

### ©Level 1 Trauma Center (Grady)

- ©100,000 visits per year
- ©Can respond to all things

### ©Big 40000 visits a year – 100 visits a day

- ©30+ exam rooms, 2+ Doctors, Ready for Trauma

### ©Medium 8000-39999 visits per year

- ©1-2 doctors on

### ©Small doctors on call

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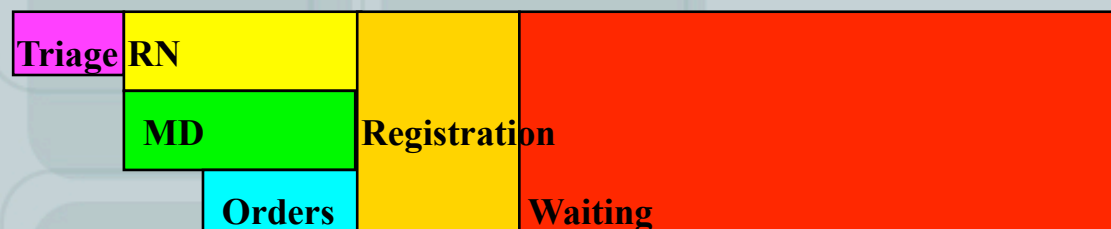
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# ED Patient Flow

## Previous Process



## Current Process



[http://www.youtube.com/watch?](http://www.youtube.com/watch?v=uJBmKb98KWc)

[v=uJBmKb98KWc](http://www.youtube.com/watch?v=uJBmKb98KWc)

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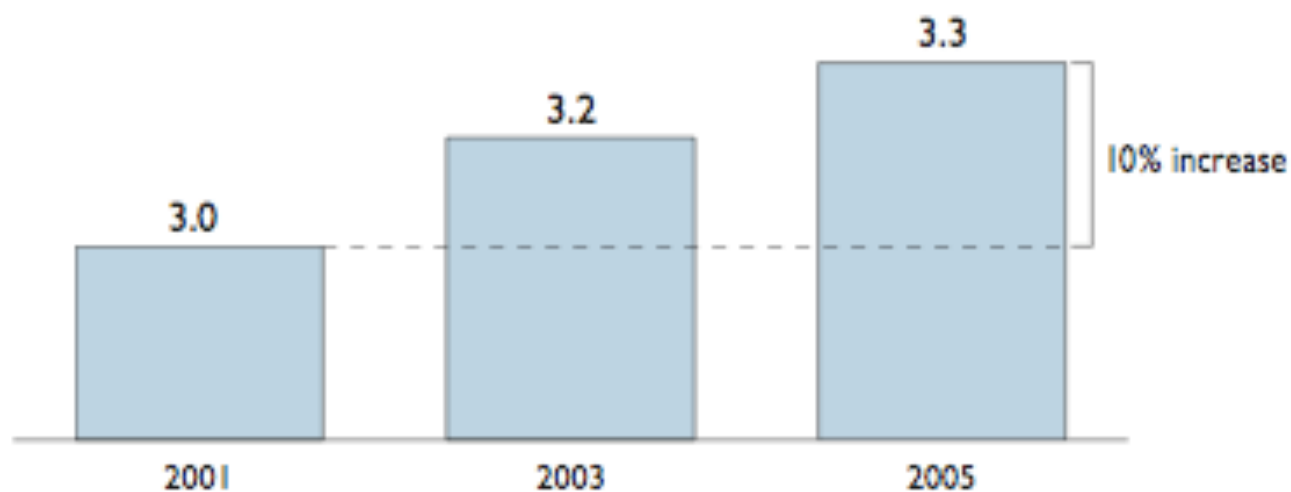




## Taking Longer to Be Seen

Average ED Length of Stay (LOS)

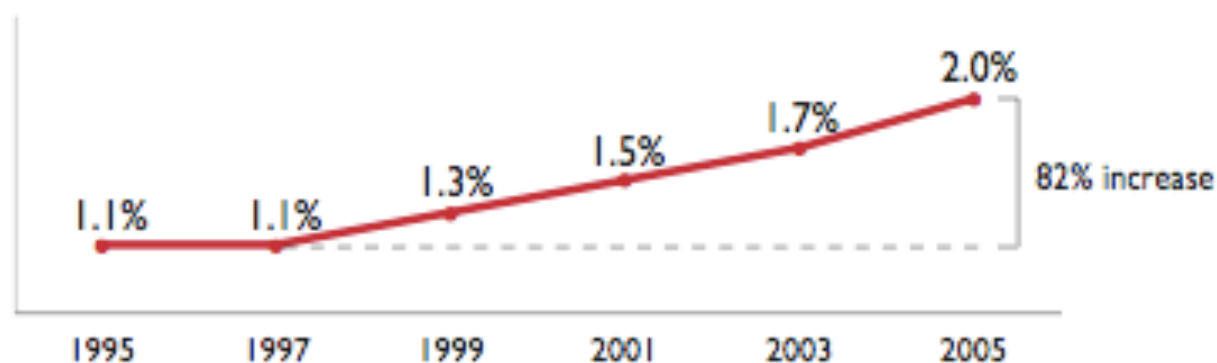
*Hours*



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## Unwilling to Wait

Percentage of Patients Leaving the ED Without Being Seen



Source: Centers for Disease Control, National Hospital Ambulatory Medical Care Survey: Emergency Department Summary, 1997–2007.

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## ED-Related Measures

### *Heart Attack (AMI)*

- #1) Aspirin at arrival
- #2) Beta blocker at arrival
- #3) Fibrinolytic agent w/in 30 minutes of arrival
- #4) PCI w/in 120 minutes of arrival<sup>1</sup>

2 percent of  
payment at risk  
if not reported

### *Pneumonia*

- #5) Initial antibiotic w/in four hours of arrival
- #6) Oxygenation assessment
- #7) Blood culture prior to first antibiotic
- #8) Appropriate initial antibiotic selection



## Information Valued Above All

Press Ganey 2006 ED Patient Survey Results

National Emergency Department Priority Index	
Survey Item	Rank
How well were you kept informed of delays?	1
Degree to which staff cared about you as a person	2
How well was your pain controlled?	3
Nurses' concern to keep you informed about your treatment	4
Staff concern to keep family or friends informed about status during course of treatments	5

Co  
to

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